



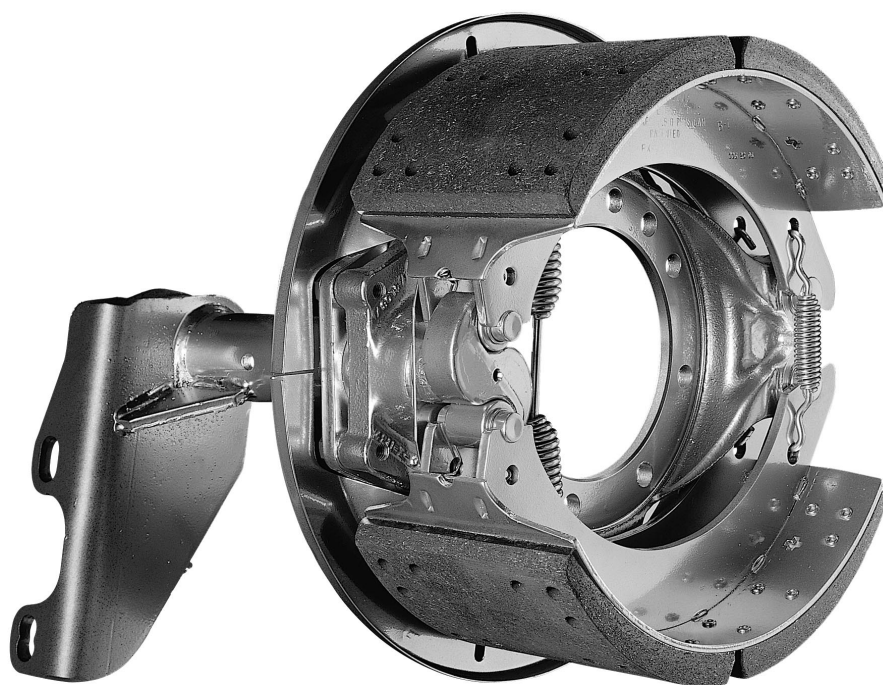
MERITOR®

an **ArvinMeritor** brand

Issued 06-97

Q Plus™ LX500 and MX500 Cam Brakes

Maintenance Manual MM-96173



Service Notes



This maintenance manual describes the correct service and repair procedures for Meritor Q Plus™ LX500 and MX500 cam brakes. The information contained in this manual was current at time of printing and is subject to change without notice or liability.

You must follow your company procedures when you service or repair equipment or components. You must understand all procedures and instructions before you begin to work on a unit. Some procedures require the use of special tools for safe and correct service. Failure to use special tools when required can cause serious personal injury to service personnel, as well as damage to equipment and components.

Meritor uses the following notations to warn the user of possible safety problems and to provide information that will prevent damage to equipment and components.



WARNING

A WARNING indicates a procedure that you must follow exactly to avoid serious personal injury.



CAUTION

A CAUTION indicates a procedure that you must follow exactly to avoid damaging equipment or components. Serious personal injury can also occur.

NOTE: A NOTE indicates an operation, procedure or instruction that is important for proper service. A NOTE can also supply information that will help to make service quicker and easier.



This symbol indicates that fasteners must be tightened to a specific torque.

Visit Our Web Site

Visit the Technical Library section of **www.meritorauto.com** for additional product and service information on Meritor's Drivetrain Plus™ component lineup.

Drivetrain Plus™ Technical Electronic Library (TEL) on CD

The CD includes product and service information on Meritor's Drivetrain Plus™ component lineup. \$20. Order TP-9853.

Videos

Meritor Cam Brake Maintenance
(Video 90233)

Automatic Slack Adjuster Installation and Maintenance (Video 90234)

New Generation Automatic Slack Adjuster
(Video T-9443V)

How to Order

Call Meritor's Customer Service Center at 800-535-5560.


 Asbestos and Non-Asbestos Fibers Warnings	1
Exploded Views	2
Section 1: Introduction	
Q Plus TM LX500 Cam Brake Package with the Extended Lube Feature	4
Q Plus TM MX500 Cam Brake with the Extended Maintenance Package Option Available for On-Highway Linehaul Applications Only Identifying Q Plus TM LX500 and MX500 Brakes Q Plus TM LX500 Cam Brakes Q Plus TM MX500 Cam Brakes	5
Comparing 15-Inch Q Plus TM LX500 and MX500 Brakes with the 15-Inch Q Series Brake Q Plus TM LX500 and MX500 Features Specifications	
Section 2: Disassembly	
Remove Wheel Components	6
Remove Brake Shoes	7
Remove Camshaft and Slack Adjuster	
Section 3: Prepare Parts for Assembly	
Cleaning Parts	8
Dry Parts After Cleaning Corrosion Protection Inspect Parts Slack Adjusters	9
Drums	
Section 4: Assembly	
Install Camshaft, Seals and Bushings	10
For Brake Assemblies with Cast Spiders	11
For Brake Assemblies with Stamped Spiders Install Brake Shoes	12
Before Specified Time or Mileage Lubrication Intervals After Specified Time or Mileage Lubrication Intervals Q Plus TM LX500 and MX500 Specifications Installing Meritor's Automatic Slack Adjuster	14
Handed and Unhanded Slack Adjusters Pull Pawls Installation Procedure Checking Brake Chamber Push Rod Stroke and Adjusting the Clevis Position	16
Brake Slack Adjuster Position (BSAP) Method Meritor's Automatic Slack Adjuster Template Adjust the Brake	18
Section 5: Reline the Brakes	
Reline the Brakes	19



Table of Contents

Section 6: Lubrication

Lubrication Intervals for Q Plus™ LX500 and MX500 Cam Brakes with Automatic Slack Adjusters	20
Do Not Lubricate the LX500 and MX500 Brakes and Automatic Slack Adjusters Before Specified Time or Mileage Intervals	
Lubricating the Q Plus™ LX500 and MX500 Cam Brakes and Automatic Slack Adjusters After Specified Time or Mileage Intervals	

Section 7: Diagnostics 22

Section 8: Recommended Periodic Service

Recommended Periodic Service	23
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Section 9: Inspection

Brake Inspections Before the Recommended Lubrication Interval	24
Brake Inspections After the Recommended Lubrication Interval	
Visual Inspection	25
Federal Roadside Inspection	
Brake In-Service Adjustment Inspection	
Truck or Tractor	26

Section 10: Torque Table 27



ASBESTOS FIBERS WARNING

The following procedures for servicing brakes are recommended to reduce exposure to asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

Hazard Summary

Because some brake linings contain asbestos, workers who service brakes must understand the potential hazards of asbestos and precautions for reducing risks. Exposure to airborne asbestos dust can cause serious and possibly fatal diseases, including asbestosis (a chronic lung disease) and cancer, principally lung cancer and mesothelioma (a cancer of the lining of the chest or abdominal cavities). Some studies show that the risk of lung cancer among persons who smoke and who are exposed to asbestos is much greater than the risk for non-smokers. Symptoms of these diseases may not become apparent for 15, 20 or more years after the first exposure to asbestos.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to asbestos dust follow. Consult your employer for more details.

Recommended Work Practices

1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons. OSHA has set a maximum allowable level of exposure for asbestos of 0.1 f/cc as an 8-hour time-weighted average and 1.0 f/cc averaged over a 30-minute period. Scientists disagree, however, to what extent adherence to the maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling asbestos dust. OSHA requires that the following sign be posted at the entrance to areas where exposures exceed either of the maximum allowable levels:

**DANGER: ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA.**

2. **Respiratory Protection.** Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.

3. **Procedures for Servicing Brakes.**

- a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.
- b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
- c. If an enclosed vacuum system or brake washing equipment is not available, employers may adopt their own written procedures for servicing brakes, provided that the exposure levels associated with the employer's procedures do not exceed the levels associated with the enclosed vacuum system or brake washing equipment. Consult OSHA regulations for more details.
- d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
- e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. **Cleaning Work Areas.** Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. **Waste Disposal.** Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.



NON-ASBESTOS FIBERS WARNING

The following procedures for servicing brakes are recommended to reduce exposure to non-asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

Hazard Summary

Most recently manufactured brake linings do not contain asbestos fibers. These brake linings may contain one or more of a variety of ingredients, including glass fibers, mineral wool, aramid fibers, ceramic fibers and silica that can present health risks if inhaled. Scientists disagree on the extent of the risks from exposure to these substances. Nonetheless, exposure to silica dust can cause silicosis, a non-cancerous lung disease. Silicosis gradually reduces lung capacity and efficiency and can result in serious breathing difficulty. Some scientists believe other types of non-asbestos fibers, when inhaled, can cause similar diseases of the lung. In addition, silica dust and ceramic fiber dust are known to the State of California to cause lung cancer. U.S. and international agencies have also determined that dust from mineral wool, ceramic fibers and silica are potential causes of cancer.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to non-asbestos dust follow. Consult your employer for more details.

Recommended Work Practices

1. **Separate Work Areas.** Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.

2. **Respiratory Protection.** OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m³ as an 8-hour time-weighted average. Some manufacturers of non-asbestos brake linings recommend that exposures to other ingredients found in non-asbestos brake linings be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust.

Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times during brake servicing will help minimize exposure.

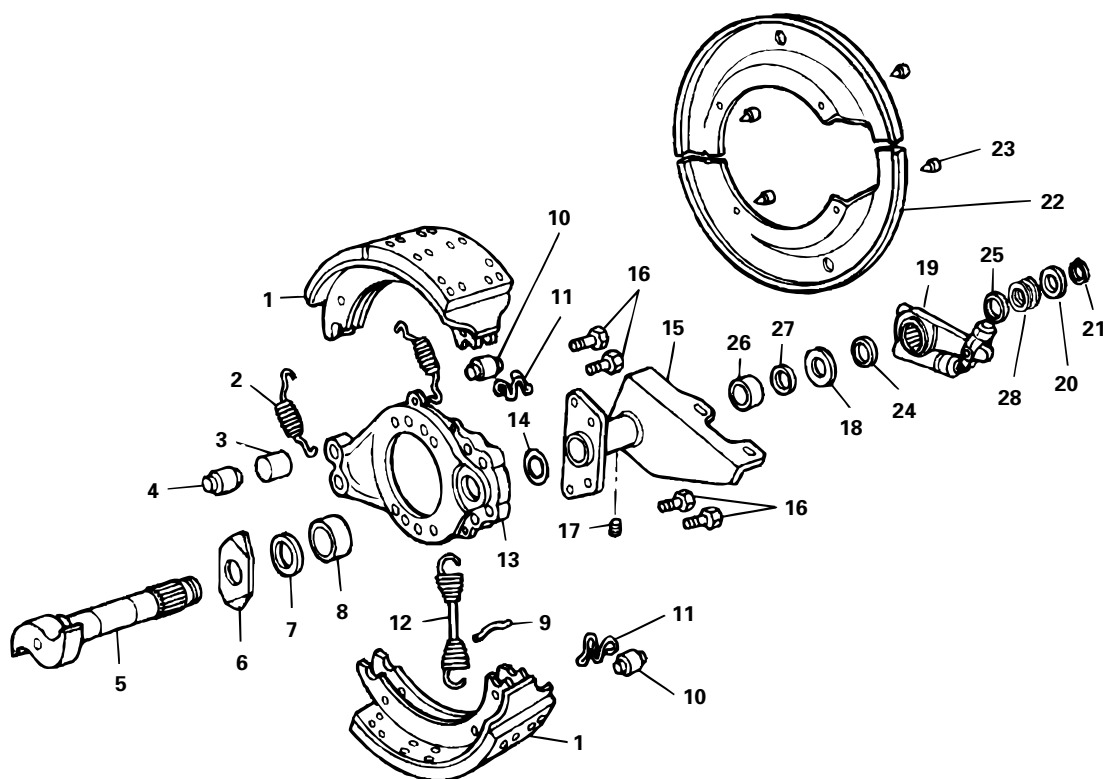
3. **Procedures for Servicing Brakes.**

- a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.
- b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
- c. If an enclosed vacuum system or brake washing equipment is not available, carefully clean the brake parts in the open air. Wet the parts with a solution applied with a pump-spray bottle that creates a fine mist. Use a solution containing water, and, if available, a biodegradable, non-phosphate, water-based detergent. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.
- d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.
- e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.
4. **Cleaning Work Areas.** Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize exposure. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.
5. **Worker Clean-Up.** After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.
6. **Waste Disposal.** Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.

Exploded Views

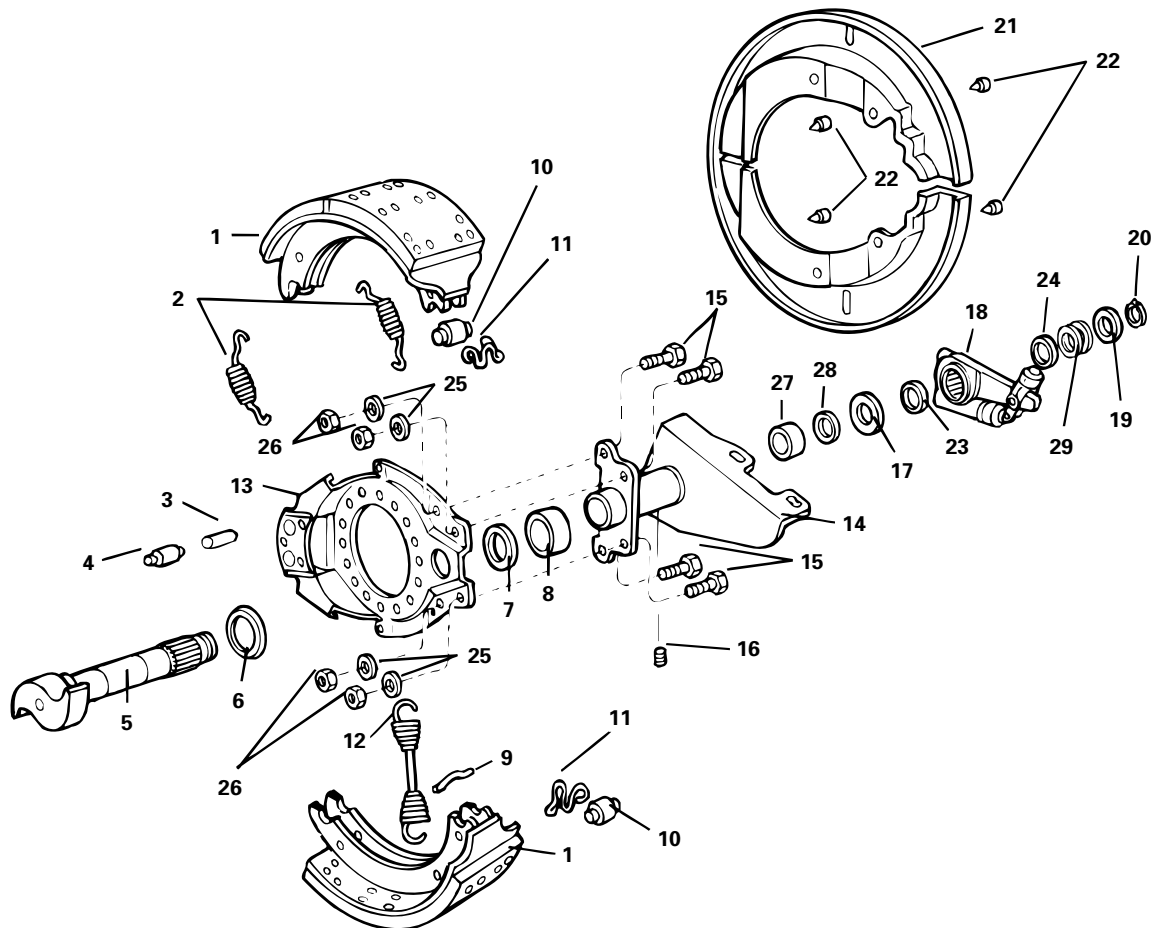


15-INCH Q PLUS™ LX500 AND MX500 CAST SPIDER BRAKE

Item	Description
1	Shoe and lining assembly
2	Spring — shoe retaining
3	Bushing — anchor pin
4	Anchor pin — brake shoe
5	Camshaft — LX500
6	Washer — camhead
7	Orange seal — camshaft
8	Bushing — camshaft 1.625" I.D.
9	Pin — return spring
10	Roller — brake shoe
11	Retainer — shoe roller

Item	Description
12	Spring — brake shoe return
13	Cast Spider — brake
14	Seal — chamber bracket
15	Bracket — camshaft & chamber
16	Capscrew — chamber bracket
17	Plug — pipe
18	Washer — camshaft (thick)
19	Slack adjuster — automatic

Item	Description
20	Washer — spacing
21	Snap ring — camshaft
22	Dust shield
23	Capscrew — dust shield
24	Seal — ASA
25	Orange seal — ASA
26	Bushing — camshaft 1.50" I.D.
27	Seal — camshaft
28	Washer — spacing (thin)



16.5-INCH Q PLUS™ DRIVE AXLE LX500 AND MX500 STAMPED SPIDER BRAKE

Item	Description
1	Shoe and lining assembly
2	Spring — shoe retaining
3	Bushing — anchor pin
4	Anchor pin — brake shoe
5	Camshaft — "S" head
6	Washer — camhead
7	Orange seal — camshaft
8	Bushing — camshaft 1.625" I.D.
9	Pin — return spring
10	Roller — brake shoe
11	Retainer — shoe roller

Item	Description
12	Spring — brake shoe return
13	Stamped spider — brake
14	Bracket — camshaft & chamber
15	Capscrew — Grade 8
16	Plug — pipe
17	Washer — camshaft (thick)
18	Slack adjuster — automatic
19	Washer — spacing
20	Snap ring — camshaft

Item	Description
21	Dust shield
22	Capscrew — dust shield
23	Seal — ASA
24	Orange seal — ASA
25	Washer (4) — hard
26	Nut (4) — Grade 8
27	Bushing — camshaft 1.50" I.D.
28	Seal — camshaft
29	Washer — spacing (thin)

Section 1

Introduction



Q Plus™ LX500 Cam Brake Package with the Extended Lube Feature



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

NOTE: You must continue to observe all other brake preventive maintenance schedules and procedures for Q Plus™ LX500 and MX500 cam brakes with factory-installed Meritor automatic slack adjusters.

Meritor's new Q Plus™ LX500 cam brake package includes:

- Q Plus™ LX500 cam brakes
- Meritor factory-installed automatic slack adjusters with threaded or welded clevises
- **Extended Lube Feature:** For on-highway linehaul applications, the Q Plus™ LX500 camshaft and slack adjusters do not require periodic lubrication for **three years or 500,000 miles (805,000 km), whichever comes first.** For all other vehicle applications, the lubrication interval is **one year, regardless of mileage.**

Q Plus™ MX500 Cam Brake with the Extended Maintenance Package Option

Available for On-Highway Linehaul Applications Only

Meritor's new Q Plus™ MX500 cam brake is available for on-highway linehaul applications only and includes:

- **Extended Maintenance Package:** Proprietary friction material on 5-inch shoes for steer axles and 8-inch shoes for drive axles for more wearable volume than LX500 Q Plus™ brakes.
- **Extended Lube Feature:** The Q Plus™ MX500 camshaft and slack adjusters do not require periodic lubrication for **three years or 500,000 miles (805,000 km), whichever comes first.**
- Meritor factory-installed automatic slack adjusters with threaded or welded clevises

Identifying Q Plus™ LX500 and MX500 Brakes

NOTE: Do not remove the identification tag from the camshaft bracket during the extended maintenance period.

You can identify Q Plus™ LX500 and MX500 cam brakes by checking the identification tags affixed to the brake.

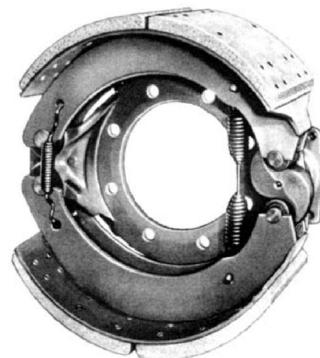
1. A brake shoe tag identifies the brake as Q Plus™.
2. An additional identification tag imprinted with **"SEE MERITOR MAINTENANCE MANUAL MM-96173 FOR LUBE INFO,"** which is affixed to the brake chamber bracket over the top of the plugged grease hole, identifies the brake as a Q Plus™ LX500 or MX500 brake.
3. Q Plus™ LX500 and MX500 brakes and Meritor automatic slack adjusters do not have grease fittings.

Q Plus™ LX500 Cam Brakes

The Q Plus™ LX500 package consists of:

- 15-inch × 4-inch or 5-inch cam brakes on steer axle
- 16.5-inch × 7-inch or 8-inch cam brakes on drive axle
- 15-inch × 8-5/8-inch cam brakes on drive axle for 19.5-inch wheels. **Figure 1.1.**

Figure 1.1



**16.5" Q PLUS™ LX500 BRAKE
WITH STAMPED SPIDER**

Q Plus™ MX500 Cam Brakes

The Q Plus™ MX500 package consists of:

- 15-inch × 5-inch cam brakes on steer axle with proprietary lining
- 16.5-inch × 8-inch cam brakes on rear drive axle with proprietary lining
- Plus LX500 components

Comparing 15-Inch Q Plus™ LX500 and MX500 Brakes with the 15-Inch Q Series Brake

Q Plus™ LX500 and MX500 15-inch cam brakes offer the following features not available on the 15-inch Q series brake.

- Double web shoe
- Cast spider
- 1.5-inch, 28-spline camshaft
- 1.75-inch offset
- 0.75-inch tapered block lining

Q Plus™ LX500 and MX500 Features

- LX500 and MX500 seals, bushings and grease, along with precision-machined components, keep water and contaminants out and lubrication in the assembly.
- A larger heat-treated cam head journal diameter reduces bearing stress to increase cam and bushing life.
- A new coated, steel-backed bushing at cam head.
- The MX500 package includes wider shoes with proprietary friction material for more wearable lining volume.
- New fiber-blended spline-end bushing improves wear resistance.
- **Optional:** An integrated brake spider is available on the Easy Steer Plus™ front axle.

Specifications

NOTE: Specific applications require approval from Meritor brake engineering. For complete technical information, spec'ing assistance or original equipment manufacturer (OEM) replacement parts, contact Meritor's Customer Service Center at 800-535-5560 or your Meritor representative.

Recommended GAWR* Range (lbs)	Size Diameter × Width (inch)	Configuration		Applications
		Shoes	Spiders	
7-14,000	15 × 4	Fabricated	Cast	Steer Axle
10-14,600	15 × 5			Steer Axle
15-20,000	15 × 8-5/8			Drive Axle (19.5 Wheels)
17-23,000	16.5 × 7		Stamped	Drive Axle
17-23,000	16.5 × 8			Drive Axle

* Gross Axle Weight Rating

Section 2 Disassembly



Remove Wheel Components

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Asbestos and Non-Asbestos Fibers Warning

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

WARNING

Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. The vehicle must be on a level surface.
2. Put blocks under the wheels not being raised to keep the vehicle from moving.
3. Raise the vehicle so that the area to be serviced is off the ground. Support the vehicle with safety stands.

WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

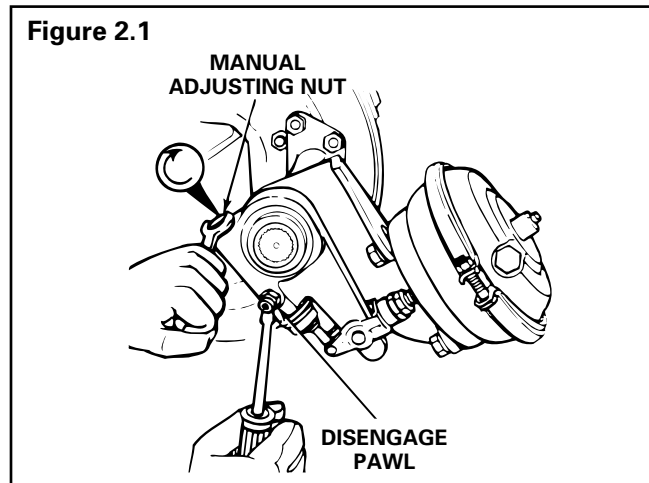
4. If the brake has spring chambers, carefully cage and lock the spring so that the spring cannot actuate during disassembly.
5. Fully release the slack adjusters so that the shoes retract and the drums clear the linings.

CAUTION

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

6. Use a screwdriver or equivalent tool to disengage the pawl assembly. **Figure 2.1.**

Figure 2.1



7. Use a wrench to turn the manual adjusting nut until the brake shoes are fully retracted.
8. Remove the screwdriver so the pawl snaps back into engagement.
9. Use standard procedures to remove the wheels and drums from the axle.

Remove Brake Shoes

1. Push down on the bottom brake shoe and pull on the roller retaining clip to remove the bottom cam roller. **Figure 2.2.**
2. Lift the top brake shoe and pull on the roller retaining clip to remove the top cam roller.
3. Lift the bottom shoe to release the tension on the brake return spring. Remove the spring. **Figure 2.3.**
4. Rotate the bottom shoe to release the tension on the two retaining springs. Remove the springs and brake shoes. **Figure 2.4.**

Figure 2.2

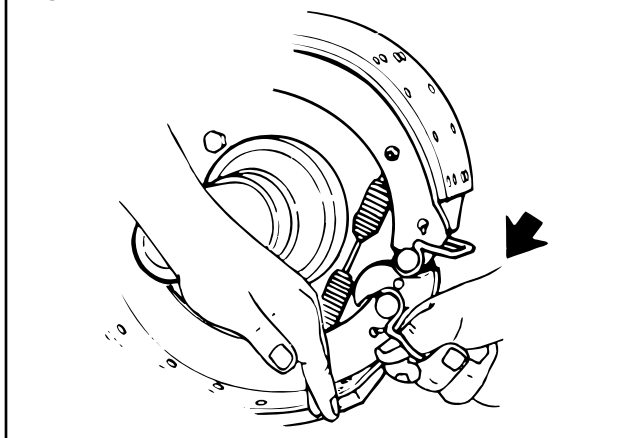


Figure 2.3

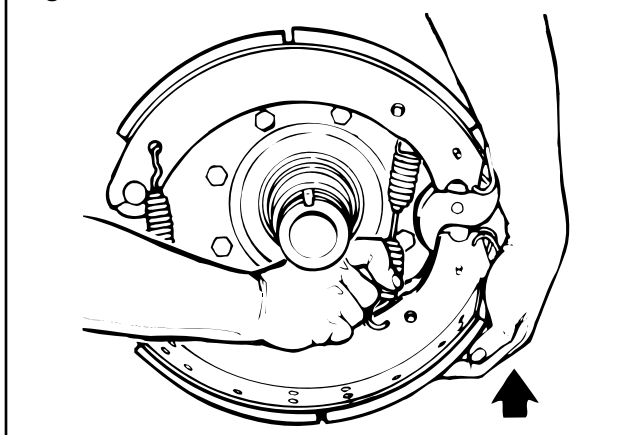
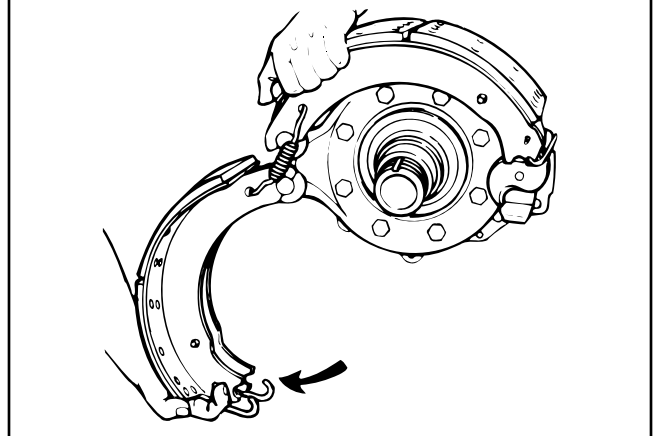


Figure 2.4



Remove Camshaft and Slack Adjuster

NOTE: Meritor recommends checking the bushings at every reline. If the bushings need replacement, follow the procedure listed below.

1. Remove the large and small clevis pins.

CAUTION

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

2. Disengage the pull pawl. Rotate the slack adjuster away from the clevis.

NOTE: You cannot remove a welded clevis from the chamber assembly. If the welded clevis is damaged or worn, replace the chamber assembly. To remove a threaded clevis, loosen the jam nut and unthread the clevis from the brake chamber rod.

3. Remove the snap ring, washer, spacing washer and orange Automatic Slack Adjuster (ASA) seal from the camshaft.
4. Remove the slack adjuster from the camshaft.
5. Pull the camshaft from the spider and bracket.

Section 3

Prepare Parts for Assembly



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer's product instructions and these procedures:

- *Wear safe eye protection.*
- *Wear clothing that protects your skin.*
- *Work in a well-ventilated area.*
- *Do not use gasoline, or solvents that contain gasoline. Gasoline can explode.*
- *You must use hot solution tanks or alkaline solutions correctly. Follow the manufacturer's instructions carefully.*



CAUTION

Do not use hot solution tanks or water and alkaline solutions to clean ground or polished parts. Damage to parts will result.

Only use solvent cleaners on metal parts. Damage to parts will result.

Cleaning Parts



CAUTION

Do not disassemble the factory-installed automatic slack adjusters on Meritor's Q Plus™ LX500 and MX500 cam brakes. Damage to components can result.

1. Use soap and water to clean non-metal parts.
2. Use soft paper or cloth that is free from dirt, oil or abrasives to dry the parts completely.

Dry Parts After Cleaning

Dry the parts immediately after cleaning. Dry parts with clean paper or rags, or compressed air.

Corrosion Protection

NOTE: Parts must be clean and dry before you lubricate them.

1. **If you assemble parts immediately after you clean them:** Lubricate parts with grease to prevent corrosion. Parts must be clean and dry before you lubricate them.
2. **If you store parts after you clean them:** Apply a corrosion-preventive material. Store parts in a special paper or other material that prevents corrosion.

Inspect Parts

It is important to carefully inspect all parts before assembly. Check all parts for wear or damage. Repair or replace them as required.

1. Check the spider for expanded anchor pin holes and for cracks. Replace damaged spiders and anchor pin bushings.
2. Check the camshaft bracket for broken welds, cracks and correct alignment. Replace damaged brackets.
3. Check anchor pins for corrosion and wear. Replace damaged anchor pins.
4. Check brake shoes for rust, expanded rivet holes, broken welds and correct alignment. Replace a shoe with any of the above conditions.

On 16.5-inch brake shoes only: Anchor pin holes must not exceed 1.009-inches (25.63 mm) in diameter. The distance from the center of the anchor pin hole to the center of the roller hole must not exceed 12.779-inches (32.46 cm). Replace any shoe with measurements that do not meet specifications.

5. Check the camshaft for cracks, wear and corrosion. Check the cam head, bearing journals and splines. Replace damaged camshafts.

Slack Adjusters

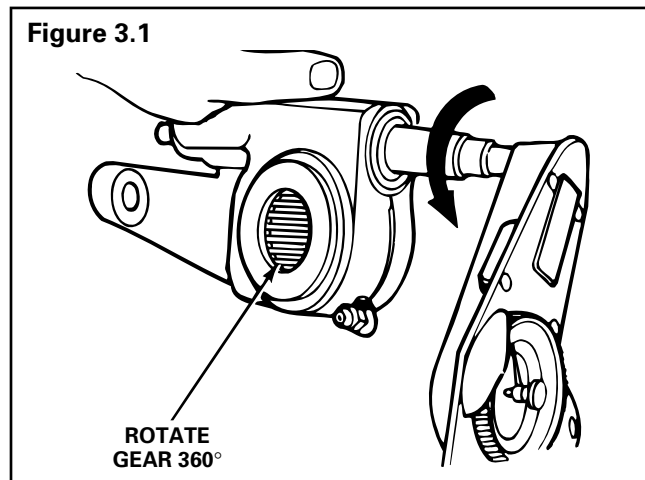
⚠ CAUTION

Always replace used clevis pin retainer clips with new ones when servicing the automatic slack adjuster or chamber. Do not reuse clevis pin retainer clips after removing them. Discard used clips. When removed for maintenance or service, clevis pin retainer clips can be bent or "gapped apart" and can lose retention. Damage to components can result.

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

1. Check the clevis pins and the bushing in the arm of the slack adjuster. Replace the pins if they are worn. Replace the bushing if its diameter exceeds 0.531-inch (13.5 mm).
2. Check Meritor automatic slack adjusters by rotating the adjusting nut to the **LEFT** with an inch-pound torque wrench. **Figure 3.1**. Turn the gear 360 degrees (22 rotations of the adjusting nut).
 - For a new slack adjuster, the torque **MUST** remain less than 25 lb-in (2.8 N•m) for 360 degrees. **T**
 - For an in-service slack adjuster, the torque **MUST** remain less than 40 lb-in (4.52 N•m) for 360 degrees. **T**

Figure 3.1



⚠ CAUTION

Do not disassemble the factory-installed automatic slack adjusters on Meritor's Q Plus™ LX500 and MX500 cam brakes. Damage to components can result.

- If the torque value exceeds the specifications, the slack adjuster is not working correctly. Inspect and replace the slack adjuster as necessary.

Drums

NOTE: Meritor recommends that you do **not** turn or rebores a brake drum. Turning or reboring drums can decrease the strength and heat capacity of the drum.

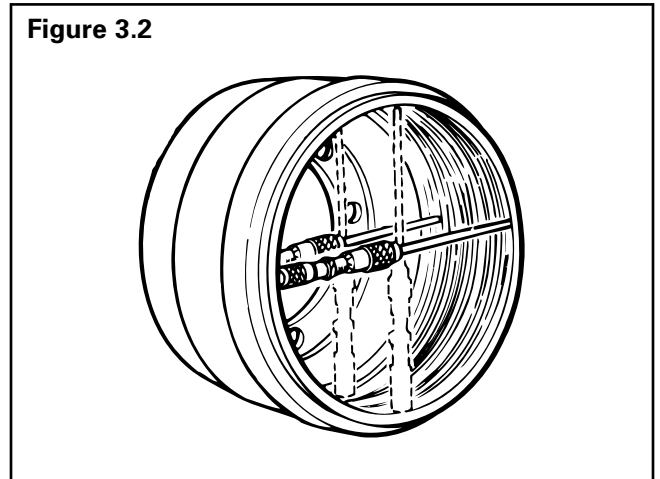
1. Check the brake drums for cracks, severe heat checking, heat spotting, scoring, pitting and distortion. Replace drums as required.
2. Measure the inside diameter of the drum in several locations with a drum caliper or internal micrometer. **Figure 3.2**. Replace the drum if the diameter exceeds the specifications supplied by the drum manufacturer.

⚠ WARNING

Do not operate the vehicle with the brake drum worn or machined beyond the discard dimension indicated on the drum. The brake system may not operate correctly. Damage to components and serious personal injury can result.

3. Check dust shields for rust and distortion. Repair or replace damaged shields as necessary.

Figure 3.2



Section 4 Assembly

Install Camshaft, Seals and Bushings

Figure 4.1

⚠ WARNING

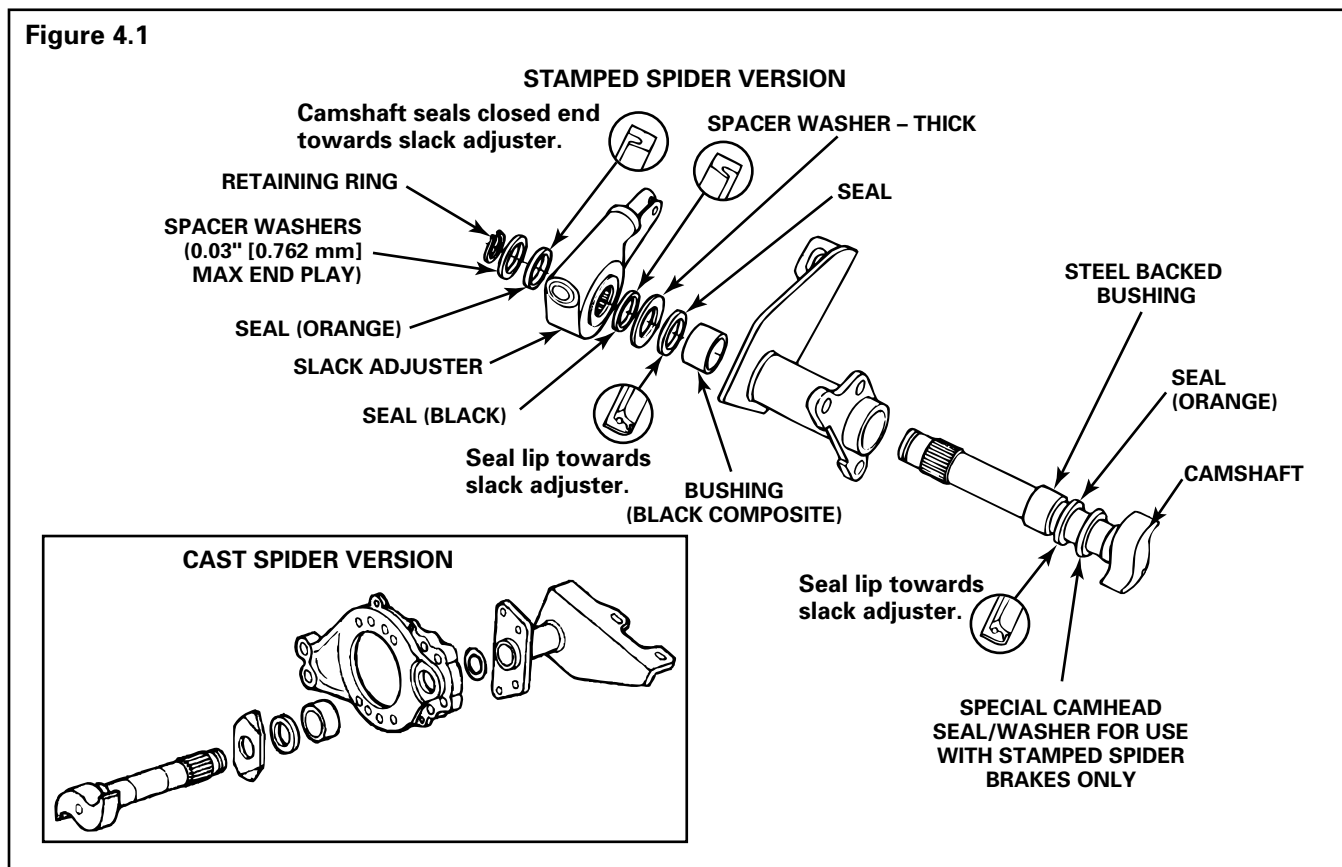
To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

⚠ Asbestos and Non-Asbestos Fibers Warning

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

NOTE: To help avoid shorter lining life, Meritor recommends replacing springs, rollers, and anchor pins at each reline.

Figure 4.1




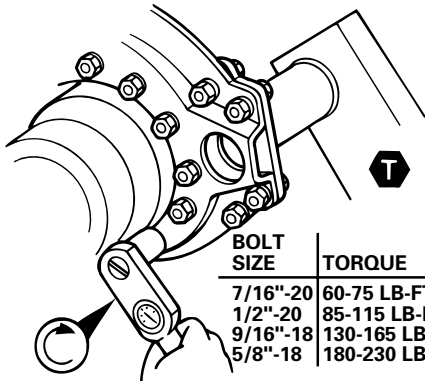
1. Check that all the spider mounting bolts are tightened to the correct torque specified in Figure 4.2. 

Figure 4.2



BOLT SIZE	TORQUE	
7/16"-20	60-75 LB-FT	81-102 N·m
1/2"-20	85-115 LB-FT	115-156 N·m
9/16"-18	130-165 LB-FT	176-224 N·m
5/8"-18	180-230 LB-FT	244-312 N·m

CAUTION

To disassemble the bracket from the spider, remove the bolts. Rotate the bracket wing to loosen the bracket. Do not hit the end of the chamber bracket tube that protrudes from the spider. Damage to components can result.

2. If the camshaft bracket was removed, install the O-ring and bracket on the spider. Tighten the capscrews to the correct torque specified in the table in Section 10.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Prior to installing the camshaft into the brake:

3. Clean the journals with an emery cloth.
4. Lubricate the camshaft splines with Meritor specification O-695, NLGI Grade 2 lubricant.

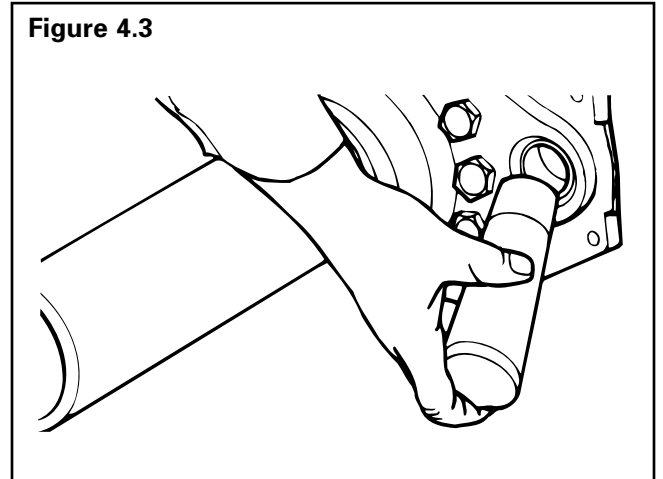
For Brake Assemblies with Cast Spiders:

- Install one seal and bushing in the spider.
- Install one seal and bushing in the chamber bracket tube. **Figure 4.1.**

For Brake Assemblies with Stamped Spiders:

- Install both seals and bushings in the chamber bracket tube. **Figure 4.1.**
1. Use a seal driver to install new camshaft bushings and seals in the spider and camshaft bracket. **Figure 4.3.**

Figure 4.3

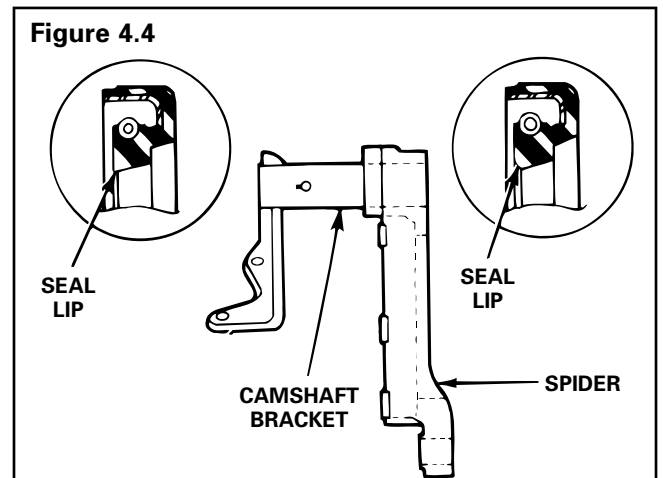


CAUTION

You must install both seals with the lips facing TOWARD the automatic slack adjuster, so that grease can purge from the slack adjuster end of the camshaft. If grease purges from the cam end, damage to components can result.

2. Install the seals with the seal lips facing TOWARD the automatic slack adjuster. **Figure 4.4.**

Figure 4.4

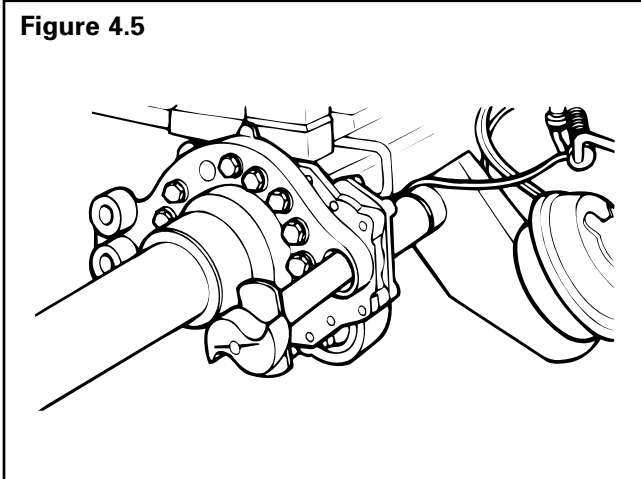


Section 4 Assembly



3. Install the cam head washer onto the camshaft with the bent flaps toward the spider.
4. Apply Meritor specification O-695 synthetic grease to the camshaft bushings and journals.
5. Install the camshaft through the spider and bracket so that the camshaft turns freely by hand. **Figure 4.5.**

Figure 4.5



Install Brake Shoes

Before Specified Time or Mileage Lubrication Intervals

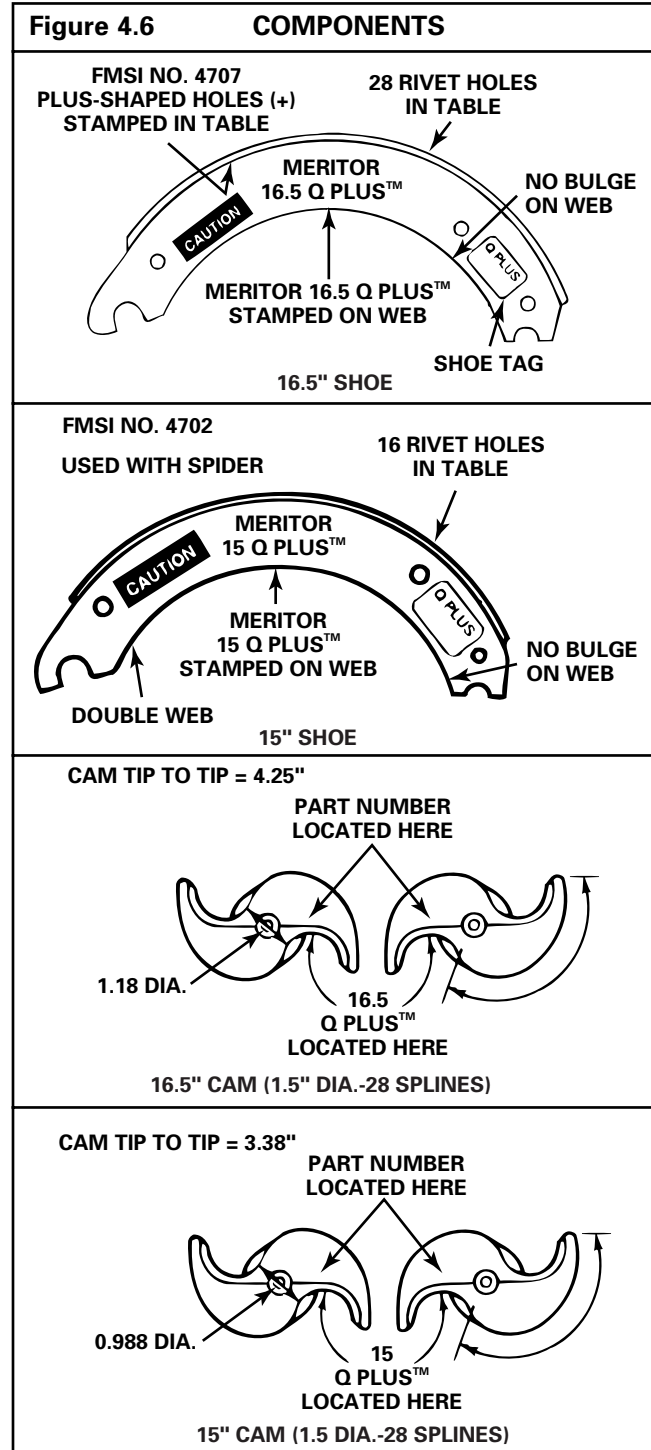
When you install brake shoes on Q Plus™ LX500 and MX500 cam brakes **BEFORE** the specified time or mileage lubrication intervals, only grease clevis pins, anchor pins and shoe rollers. Refer to "Do Not Lubricate the LX500 and MX500 Brakes and Automatic Slack Adjusters Before Specified Time or Mileage Intervals" in Section 6 of this manual.

After Specified Time or Mileage Lubrication Intervals

When you install brake shoes on Q Plus™ LX500 and MX500 cam brakes after the specified time or mileage lubrication intervals, refer to "Lubricating the Q Plus™ LX500 and MX500 Cam Brakes and Automatic Slack Adjusters After Specified Time or Mileage Intervals" in Section 6 of this manual for service procedures.

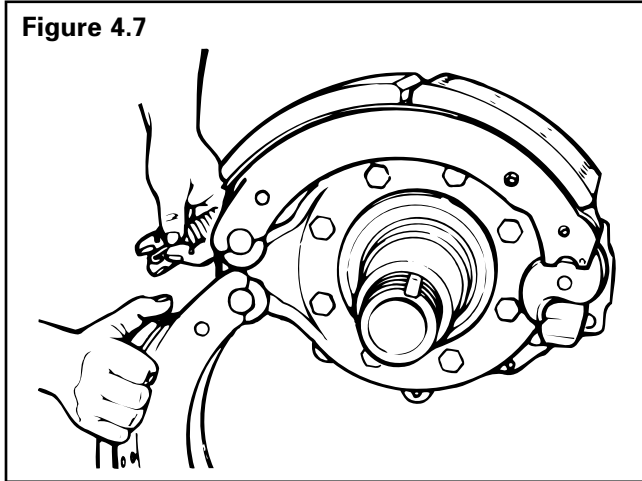
Q Plus™ LX500 and MX500 Specifications

The illustrations below show specifications for 15-inch and 16.5-inch Q Plus™ LX500 and MX500 cam brake shoes and cams. **Figure 4.6.**



1. Put the upper brake shoe in position on the top anchor pin. Hold the lower brake shoe on the bottom anchor pin and install two new brake shoe retaining springs. **Figure 4.7.**

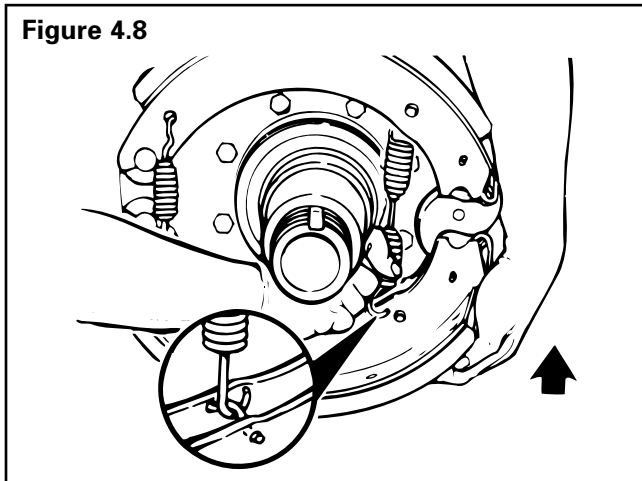
Figure 4.7



2. Rotate the lower brake shoe forward and install a new brake shoe return spring. Install the open end of the spring hooks toward the camshaft. **Figure 4.8.**

NOTE: Use of a spring tool may be required to assemble the new brake shoe return spring.

Figure 4.8



3. Pull each brake shoe away from the cam to permit enough space to install the cam rollers and retainers. Press the ears of the retainer together to permit the retainer to fit between the brake shoe webs. **Figure 4.9.**
4. Push the retainer into the brake shoe until its ears lock in the holes in the shoe webs. **Figure 4.10.**

Figure 4.9

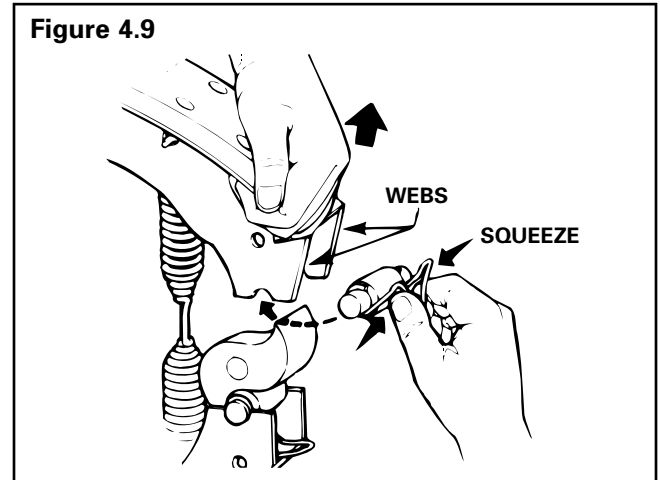
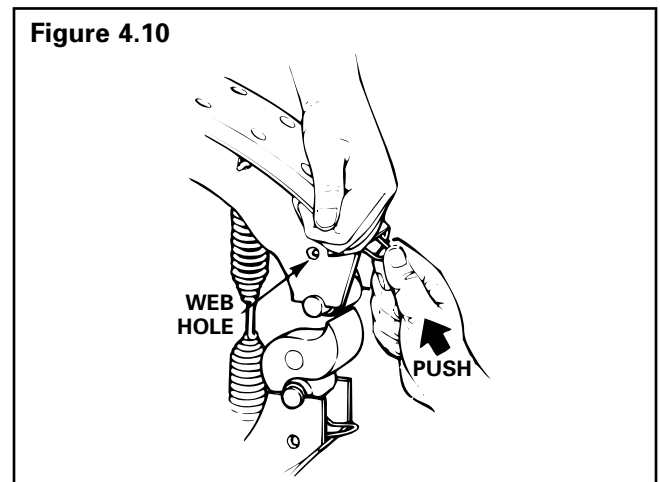


Figure 4.10



Section 4 Assembly



Installing Meritor's Automatic Slack Adjuster

Handed and Unhanded Slack Adjusters

There are two different automatic slack adjuster designs: **HANDED** and **UNHANDED**. For most applications, install a **HANDED** automatic slack adjuster so that the pawl faces **INBOARD** on the vehicle.

The pawl can be on either side or on the front of the slack adjuster housing. **Figure 4.11**.

Pull Pawls

Pull pawls are spring loaded. Pry the pull pawl at least 1/32-inch to disengage the teeth. **Figure 4.12**. When you remove the pry bar, the "pull pawl" will re-engage automatically.

Installation Procedure

If you are installing a new automatic slack adjuster, it must be the same type and size as the one you will replace. The table below shows slack adjuster lengths for each brake chamber size.

Chamber and Slack Adjuster Sizes

Length of Slack Adjuster (Inches)	Size of Chamber (Square Inches)
5-1/2	16, 20, 24, 30, 36

1. Install the thick large O.D. spacing washer on the camshaft.
2. Install the automatic slack adjuster seal on the camshaft in the direction shown in **Figure 4.13**.
3. Install the slack adjuster on the splines of the camshaft.
4. Install the orange slack adjuster seal in the direction shown in **Figure 4.13**.
5. Place the appropriate number of spacing washers between the slack adjuster and the snap ring to ensure less than 0.020-inch (0.51 mm) axial end play of the camshaft.

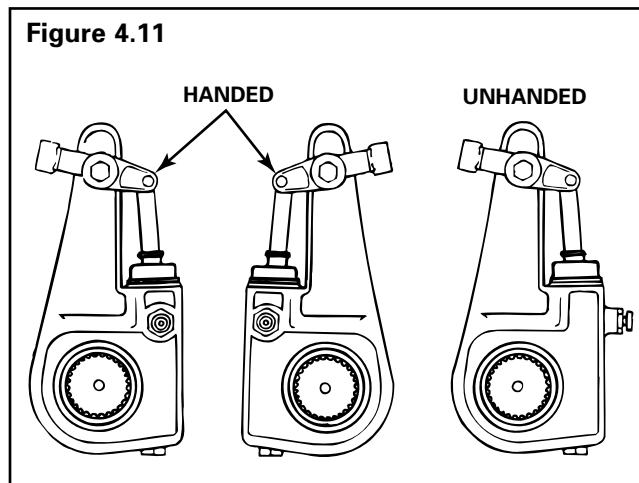


Figure 4.12

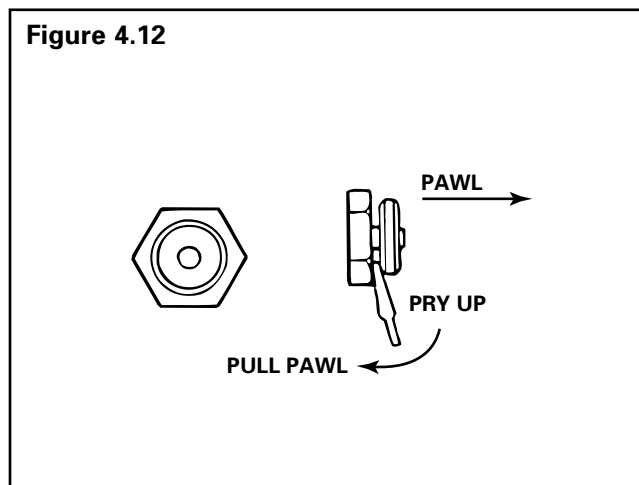
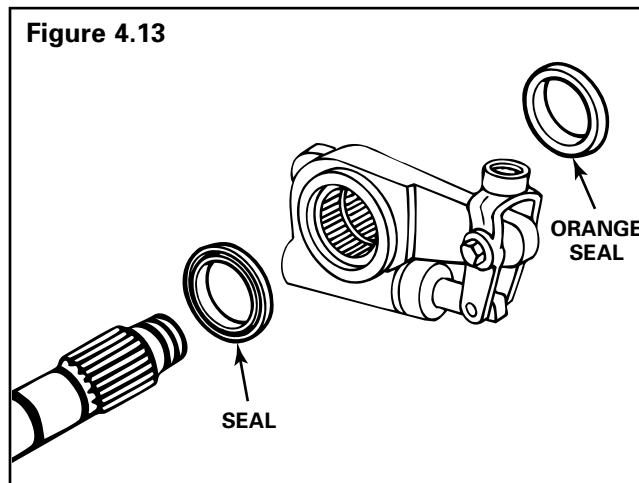


Figure 4.13





CAUTION

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

6. Disengage the pawl. Turn the manual adjusting nut to align the holes in the slack adjuster arm and the clevis. **Figure 4.14.**



CAUTION

Always replace used clevis pin retainer clips with new ones when servicing the automatic slack adjuster or chamber. Do not reuse clevis pin retainer clips after removing them. Discard used clips. When removed for maintenance or service, clevis pin retainer clips can be bent or "gapped apart" and can lose retention. Damage to components can result.

For a Welded Clevis

7. Apply anti-seize compound to the two clevis pins. Install the clevis pins through the clevis and the slack adjuster.
8. Install the cotter pins or clevis pin retainer clips to hold the clevis pins in place.
Figure 4.15.

For a Threaded Clevis

- Refer to "Installing a Threaded Clevis" on page 17.

Figure 4.14

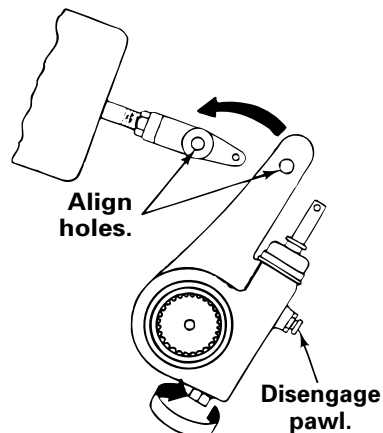
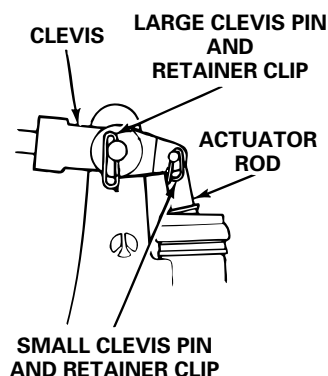


Figure 4.15




LARGE CLEVIS PIN
RETAINER CLIP
P/N 2257-D-1174


SMALL CLEVIS PIN
RETAINER CLIP
P/N 2257-C-1173



The clevis pin retainer clips must be fully installed and positioned around the side of clevis pin.

Section 4 Assembly



Checking Brake Chamber Push Rod Stroke and Adjusting the Clevis Position

NOTE: You cannot adjust the clevis position on a chamber push rod that is equipped with a welded clevis.

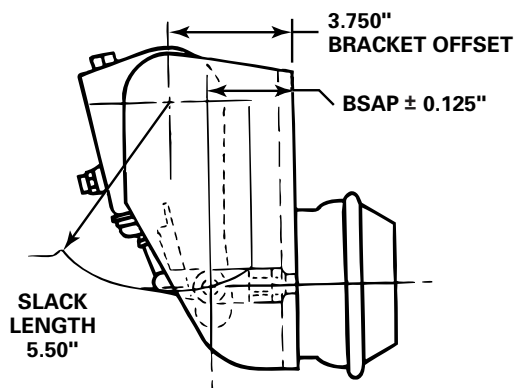
There are two methods you can use to adjust the clevis position on a chamber push rod that is equipped with a **threaded clevis**:

- The Brake Slack Adjuster (BSAP) method.
- Meritor's automatic slack adjuster template (for standard stroke chambers only).

Brake Slack Adjuster Position (BSAP) Method

When installing the automatic slack adjuster, verify that the BSAP dimension of the chamber matches the table in **Figure 4.16**.

Figure 4.16



Standard Stroke (inch)	Long Stroke (inch)
2.75	2.25

NOTE: A welded clevis is long stroke only.

Meritor's Automatic Slack Adjuster Template

Order the correct automatic slack adjuster template from Meritor's Customer Service Center at 800-535-5560. Specify part number TP-4786 for truck or tractor drum brakes.



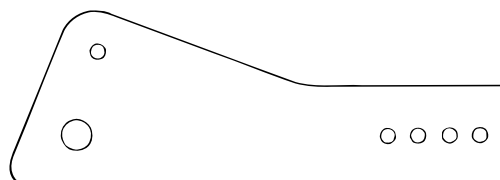
CAUTION

Use Meritor's dark brown automatic slack adjuster template for truck or tractor drum brakes, part number TP-4786, to ensure that you install the automatic slack adjuster correctly. This template is not interchangeable with other Meritor slack adjuster templates. An incorrect installation can cause the automatic slack adjuster to overadjust or underadjust. Brake drag, increased stopping distances and damage to components can occur.

Measure the Automatic Slack Adjuster

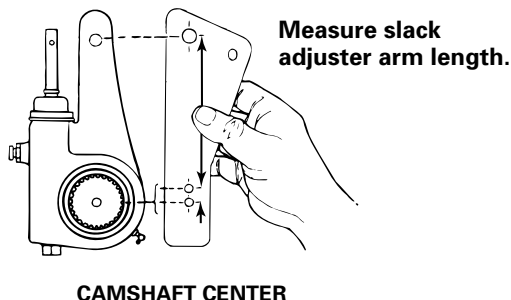
1. Use Meritor's automatic slack adjuster template part number TP-4786 to measure the length of the slack adjuster. **Figure 4.17**. The marks by the holes in the small end of the template indicate the length of the slack adjuster. **Figure 4.18**.

Figure 4.17



Color of Template	Part Number	Brake Description
Dark brown	TP-4786	Truck or tractor drum brake

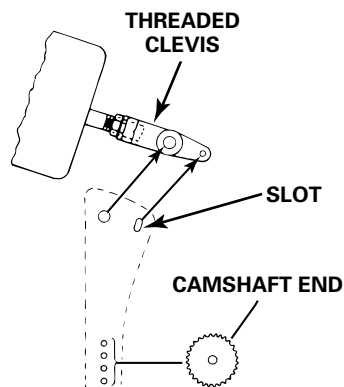
Figure 4.18



Installing a Threaded Clevis

1. Install the large clevis pin through the large holes in the template and the clevis.
2. Select the hole in the template that matches the length of the slack adjuster. Hold that hole on the center of the camshaft.
3. Look through the slot in the template. If necessary, adjust the position of the clevis until the small hole in the clevis is completely visible through the template slot. **Figure 4.19.**

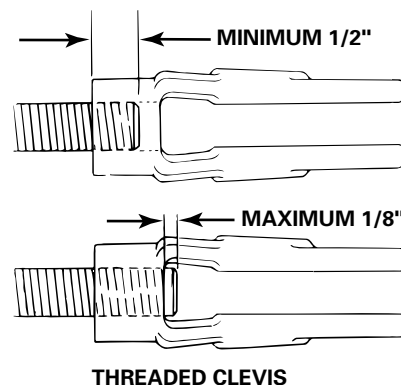
Figure 4.19



4. Check for these specifications:


- Thread engagement between the clevis and the push rod must be at least 1/2-inch (12.7 mm). **Figure 4.20.**
- The push rod must not extend through the clevis more than 1/8-inch (3.18 mm). If necessary, cut the push rod, or install a new push rod with a new air chamber.

Figure 4.20



5. Tighten the jam nut against the clevis to specifications in the table below.

Jam Nut Torque Specifications

Threads	Torque 
1/2-20	20-30 lb-ft (27-41 N•m)
5/8-18	35-50 lb-ft (48-68 N•m)

Section 4 Assembly

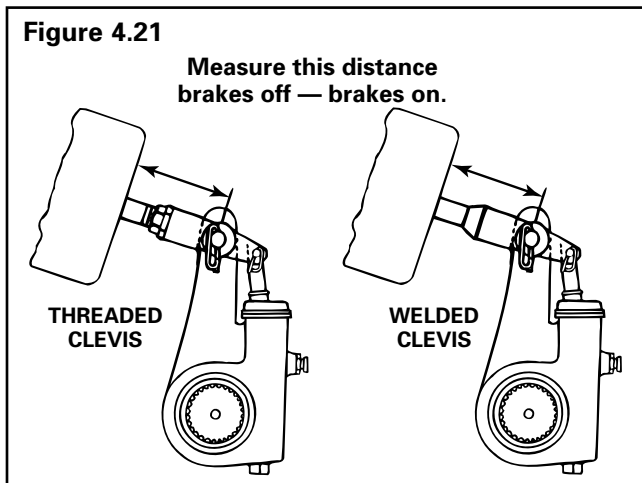


Adjust the Brake

CAUTION

You must disengage a pull pawl or remove a conventional pawl before rotating the manual adjusting nut, or you will damage the pawl teeth. A damaged pawl will not allow the slack adjuster to automatically adjust brake clearance. Replace damaged pawls before putting the vehicle in service.

1. Disengage the pawl. Turn the adjusting nut until the linings touch the drum. Turn the adjusting nut 1/2 turn in the opposite direction.
2. Measure the distance from the center of the large clevis pin to the bottom of the air chamber. **Figure 4.21.**



3. Use a pry bar to move the slack adjuster so that the linings are against the drum. Measure the same distance again. The difference between this measurement and the measurement in Step 2 is the "free stroke."
4. Turn the adjusting nut until free stroke is between 5/8–3/4-inch (15.9–19.1 mm).
5. Check the adjustment. Apply the brakes. Hold the pressure at 85 psi (586 kPa). Measure the distance from the center of the large clevis pin to the bottom of the air chamber.

6. The difference between the measurements in Step 2 and Step 5 is the adjusted chamber stroke. The adjusted stroke **MUST NOT** be greater than the dimensions shown in the Commercial Vehicle Safety Alliance (CVSA) North American Out-of-Service Criteria Reference Charts in Section 9.
7. Release the pawl assembly.

WARNING

When you work on a spring chamber, carefully follow the service instructions of the chamber manufacturer. Sudden release of a compressed spring can cause serious personal injury.

8. If the brake has spring chambers, carefully release the spring.
9. Test the vehicle to make sure that the brake system operates correctly before you put the vehicle into service.

Reline the Brakes



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.



Asbestos and Non-Asbestos Fibers Warning

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Vehicle brake systems require the correct lining material to perform as originally designed. The type of lining material that is specified is based on several technical considerations and DOT braking performance regulations. Always use the lining material specified by the vehicle manufacturer.

Always reline both wheels of a single axle and all four wheels of a tandem axle at the same time. Always install the same linings and drums on both wheels of a single axle and all four wheels of a tandem axle. It is not necessary for front and rear axles to have the same linings and drums.

Section 6 Lubrication



Lubrication Intervals for Q Plus™ LX500 and MX500 Cam Brakes with Automatic Slack Adjusters

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

The Q Plus™ LX500 and MX500 Cam Brake packages include factory-installed Meritor automatic slack adjusters. Q Plus™ LX500 and MX500 cam brakes and slack adjusters do not require lubrication for an extended period of time. (Refer to the table below.)

The camshaft hardware (seals, bushings and washers) do not require replacement for the same time period.

However, you must continue to observe all other brake preventive maintenance schedules and procedures for both Q Plus™ LX500 and MX500 cam brakes and Meritor automatic slack adjusters.

Lubrication Intervals

Q Plus™ LX500 Cam Brake	
On-Highway Linehaul	3 years/500,000 miles (805,000 km)
All Other Applications	1 year, regardless of mileage
Q Plus™ MX500 Cam Brake	
On-Highway Linehaul	3 years/500,000 miles (805,000 km)

Do Not Lubricate the LX500 and MX500 Brakes and Automatic Slack Adjusters Before Specified Time or Mileage Intervals

- Do not remove the identification tag that covers the grease plug.
- Do not grease the brake assembly or the automatic slack adjuster prior to the specified lubrication interval times or mileages in the table on this page.

Lubricating the Q Plus™ LX500 and MX500 Cam Brakes and Automatic Slack Adjusters After Specified Time or Mileage Intervals

1. Remove the identification tag from the chamber bracket.
2. Remove the grease plugs from both the chamber bracket and the automatic slack adjuster.
3. Install the grease fittings. Use Meritor-approved synthetic grease O-695 NLGI Grade 2 to lubricate the brake assembly through the grease fitting in the bracket until new grease flows from the inboard (slack end) seal.
4. Use Meritor-approved synthetic grease O-695 to lubricate the automatic slack adjuster through the grease fitting until new grease purges out of the pull pawl.
5. Replace the grease fittings with grease plugs. Cover the bracket plug with a new identification tag.
6. After the first lubrication, follow the manufacturer's chassis lubrication schedule and your regular preventive maintenance schedule. You should also continue to perform periodic inspections of the brakes. (Refer to Section 9, page 24.)

Q Plus™ LX500 and MX500 Greasing Service Intervals and Specifications

Q Plus™ LX500 Cam Brake	
On-Highway Linehaul	3 years/500,000 miles (805,000 km)
All Other Applications	1 year, regardless of mileage
Q Plus™ MX500 Cam Brake	
On-Highway Linehaul	3 years/500,000 miles (805,000 km)

Approved Greases

Lubricant	Recommendation
O-617-A O-617-B	Multi-Purpose Lithium Chassis Grease
O-645	Mobilgrease 28 (Military) Mobiltemp SHC 32 (Industrial) Aerospace Lubricants Inc. Tribolube 12-Grade 1
O-692	Amoco Super Permalube™ #2 Citgo Premium Lithium EP-2 #2 Exxon Ronex MP-2 #2 Kendall L-427 Super Blu #2 Mobilith AW-1 #1 Sohio Factran EP-2 #2
O-695	EVO-LUBE TEK-615

Component	Meritor Specification	NLGI Grade	Grease Type	Outside Temperature
Camshaft Splines and Clevis Pins	O-695	2	Synthetic Polyurea	–40°F (–40°C)
Anchor Pins When the brake is disassembled, or when necessary, lubricate the anchor pins where they touch the brake shoes.	O-617-A or O-617-B	1 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
	O-645	2	Synthetic Oil, Clay Base	Down to –65°F (–54°C)
	O-692	1 and 2	Lithium Base	Down to –40°F (–40°C)
Shoe Rollers When the brake is disassembled, or when necessary, lubricate the rollers where they touch the brake shoes. DO NOT get grease on the part of the roller that touches the cam head.	O-617-A or O-617-B	1 2	Lithium 12-Hydroxy Stearate or Lithium Complex	Refer to the grease manufacturer's specifications for the temperature service limits.
Automatic Slack Adjusters	O-695	2	Synthetic Polyurea	–40°F (–40°C)

Section 7 Diagnostics



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Symptoms	Possible Causes	Corrective Actions
<ul style="list-style-type: none"> Adjusted stroke is too long. No adjustment 	<ul style="list-style-type: none"> Incorrect slack adjuster part number 	<ul style="list-style-type: none"> Check with Warehouse Distributor or Original Equipment Manufacturer.
	<ul style="list-style-type: none"> Clevis installed at wrong angle. 	<ul style="list-style-type: none"> Use correct template or "BSAP" setting to install clevis correctly.
	<ul style="list-style-type: none"> Excessive wear between clevis and collar (more than 0.060" [1.52 mm]) 	<ul style="list-style-type: none"> Replace with threaded clevis.
	<ul style="list-style-type: none"> Loose jam nut at clevis 	<ul style="list-style-type: none"> Tighten to specification.
	<ul style="list-style-type: none"> Worn clevis pin bushing in slack arm (ID larger than 0.53" [13.46 mm]) 	<ul style="list-style-type: none"> Replace bushing.
	<ul style="list-style-type: none"> Weak or broken return spring in air chamber (Spring force must be at least 32 lb. [142.4 N] at first push rod movement.) 	<ul style="list-style-type: none"> Replace return spring or air chamber.
	<ul style="list-style-type: none"> Spring brake does not retract fully. 	<ul style="list-style-type: none"> Repair or replace spring brake.
	<ul style="list-style-type: none"> Worn or stripped teeth on pawl or actuator 	<ul style="list-style-type: none"> Replace slack adjuster.
	High torque is required to rotate worm when slack is removed from vehicle. <ul style="list-style-type: none"> In service slack, maximum worm torque: 45 lb-in (5.09 N•m) New or rebuilt slack, maximum worm torque: 25 lb-in (2.83 N•m) 	<ul style="list-style-type: none"> Replace slack adjuster.
	<ul style="list-style-type: none"> Excessive looseness between splines of camshaft and ASA gear 	<ul style="list-style-type: none"> Replace powershaft, gear or automatic slack adjuster as needed.
<ul style="list-style-type: none"> Adjusted stroke is too short. Linings drag. 	<ul style="list-style-type: none"> Non-Original Equipment Manufacturer replacement linings with excessive swell and/or growth 	<ul style="list-style-type: none"> Use Meritor approved linings.
	<ul style="list-style-type: none"> Incorrect slack adjuster part number 	<ul style="list-style-type: none"> Check with Warehouse Distributor or Original Equipment Manufacturer.
	<ul style="list-style-type: none"> Clevis installed at wrong angle. 	<ul style="list-style-type: none"> Use correct template to install clevis correctly.
	<ul style="list-style-type: none"> Loose jam nut at clevis 	<ul style="list-style-type: none"> Tighten to specification.
	<ul style="list-style-type: none"> Spring brake does not retract fully. 	<ul style="list-style-type: none"> Repair or replace spring brake.
	<ul style="list-style-type: none"> Wrong manual adjustment 	<ul style="list-style-type: none"> Adjust brake
	<ul style="list-style-type: none"> Poor contact between linings and drum, or drum is out-of-round. 	<ul style="list-style-type: none"> Repair or replace drums or linings.
	<ul style="list-style-type: none"> Brake temperature imbalance 	<ul style="list-style-type: none"> Correct brake balance.

Recommended Periodic Service



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.



CAUTION

Do not let brake lining wear to the point that the rivets or bolts touch the drum. Damage to the drum will occur.

Adjustment

- Adjust the brakes when the air chamber stroke exceeds the limits shown in the CVSA charts on page 26.

Lubrication

- Lubricate the brake and automatic slack adjuster according to the schedules on page 20.

Reline

- Reline the brake when lining thickness is 0.25-inch (6.3 mm) at the thinnest point.
- Replace shoe springs, check the drum and perform a major inspection.

Inspection

- Refer to Section 9 of this manual.

Complete Overhaul

- At every second reline, or as required.

A schedule for the periodic adjustment, cleaning, inspection and lubrication of the brake equipment must be made according to experience and the type of operation.

Brakes must be adjusted as frequently as required for correct operation and safety. The adjustments must give correct clearance between the lining and drum, correct pushrod travel and correct balance between the brakes.

NOTE: Correctly adjust wheel bearings before adjusting the brake.

Brakes must be cleaned, inspected and adjusted every time the wheel hubs are removed.

During a major overhaul, the following parts must be carefully checked and replaced with genuine Meritor Replacement Parts if required:

1. Spiders for distortion and loose bolts.
2. Anchor pins for wear and correct alignment.
3. Brake shoes for wear at anchor pin holes or roller slots.
4. Camshaft and camshaft bushings for wear.
5. Shoe return springs must be replaced.
6. Brake linings for grease on the lining, wear and loose rivets or bolts.
7. Drums for cracks, deep scratches or other damage.

To help ensure maximum lining life, Meritor recommends that springs, rollers, and anchor pins be replaced at each reline.

Section 9 Inspection



Brake Inspections Before the Recommended Lubrication Interval



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

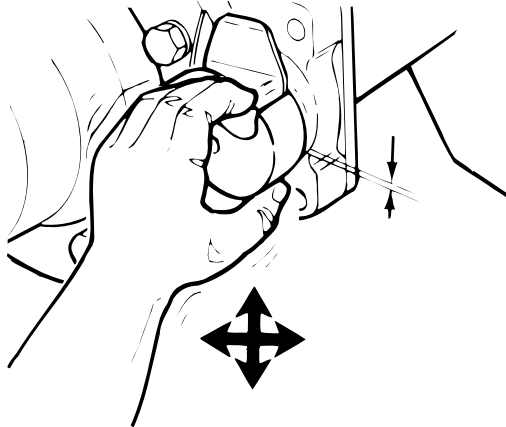
NOTE: You do not have to replace Q Plus™ LX500 and MX500 brake camshaft bushings and seals when you reline the brake prior to the recommended service interval.

1. Periodically inspect brake shoe linings. If the lining thickness is 0.25-inch (6.35 mm) at the thinnest point, reline the brakes. Refer to "Install Brake Shoes" in Section 4 of this manual.
 2. Periodically inspect the brakes for correct clearance between the lining and drum. If you must manually adjust the brakes because of excessive air chamber stroke, correct the problem. Refer to "Adjust the Brake" in Section 4 of this manual.
- If radial free play movement is less than 0.020-inch (0.51 mm): Do not replace the bushings and seals.
 - If radial free play movement exceeds 0.020-inch (0.51 mm): Replace the bushings and seals.
 - If axial end play exceeds 0.030-inch (0.76 mm): Remove the snap ring. Add the appropriate number of spacing washers between the automatic slack adjuster and the snap ring to achieve between 0.005-inch and 0.030-inch (0.127-0.762 mm) axial free play movement.

Brake Inspections After the Recommended Lubrication Interval

At the first reline, inspect the cam-to-bushing radial free play and axial end play. Radial free play movement must be less than 0.020-inch (0.51 mm). **Figure 9.1.**

Figure 9.1

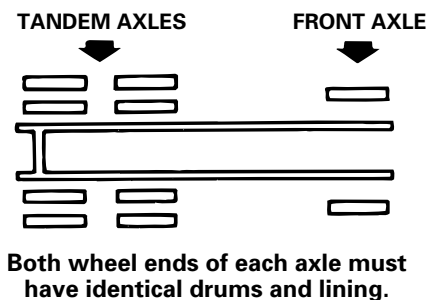


Visual Inspection

For safe operating conditions and longer component life, make these visual inspections before the vehicle is put into service:

1. Check the complete air system for worn hoses and connectors. With air pressure at 100 psi (689 kPa), brakes released and engine off, loss of tractor air pressure must not exceed two psi a minute. Total tractor and trailer loss must not exceed three psi per minute.
2. Check air compressor performance. Air system pressure must rise to approximately 100 psi (689 kPa) in two minutes.
3. The governor must be checked and set to the specifications supplied by the vehicle manufacturer.
4. The tractor or truck air system must match the specifications supplied by the vehicle manufacturer.
5. Both wheel ends of each axle must have the same linings and drums. All four wheel ends of tandem axles also must have the same linings and drums. It is not necessary for the front axle brakes to be the same as the rear driving axle brakes. **Figure 9.2.**

Figure 9.2



6. Always follow the specifications supplied by the vehicle manufacturer for the correct lining to be used. Vehicle brake systems must have the correct friction material and these requirements can vary from vehicle to vehicle.

7. The return springs must retract the shoes completely when the brakes are released. Replace the return springs each time the brakes are relined. The spring brakes must retract completely when they are released.
8. Check the air chamber size and the slack adjuster length of all wheel ends. All drive axle wheel ends should have the same size air chamber and slack adjuster length. Both steer axle wheel ends should have the same size air chamber and slack adjuster length.

Federal Roadside Inspection

Brake In-Service Adjustment Inspection

NOTE: Check brake adjustment with 80-90 psi (551-620 kPa) air pressure in the brake chambers when the brakes are fully applied. 100 psi (689 kPa) in the air tanks with the engine **OFF** will supply 80-90 psi (551-620 kPa) in the chambers when the brakes are fully applied.

- If necessary run the engine to **INCREASE** the pressure to 100 psi (689 kPa).
- Turn the engine **OFF**. Apply and release the brakes to **DECREASE** the pressure to 100 psi (689 kPa).

Section 9 Inspection



Truck or Tractor

Use the following procedures to check the in-service adjustment (adjusted chamber stroke) of truck or tractor air brakes with slack adjusters.

1. Check the gauges in the cab to make sure that the air pressure in the tanks is 100 psi (689 kPa) with the engine off and the spring chambers released.
2. With the brakes not applied, measure the distance from the bottom of the air chamber to the center of the large clevis pin on all the brakes. **Figure 9.3A.** Record each dimension.
3. Have another person apply and hold one full brake application. **Figure 9.3B.**
4. Repeat Step 2 and measure with the service brakes applied. **Figure 9.3C.** Record each dimension.
5. Release the brakes.
6. Calculate the adjusted chamber stroke of each brake:
 - a. Subtract the dimension that was measured in Step 2 from the dimension measured in Step 4.
 - b. The difference between the two dimensions is the adjusted chamber stroke. The adjusted chamber stroke must not be greater than the stroke length shown in the CVSA reference charts for that size and type of air chamber.
 - c. If the adjusted chamber stroke you measured is greater than the maximum stroke shown in the CVSA reference charts, inspect and replace the slack adjuster if necessary.

Commercial Vehicle Safety Alliance (CVSA) North American Out-of-Service Criteria Reference Charts

NOTE: A brake found at the adjustment limit is not a violation.

'Standard Stroke' Clamp Type Brake Chamber Data

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)
16	6-3/8	1-3/4
20	6-25/32	1-3/4
24	7-7/32	1-3/4
30	8-3/32	2
36	9	2-1/4

'Long Stroke' Clamp Type Brake Chamber Data

Type	Outside Diameter (inches)	Brake Adjustment Limit (inches)
16	6-3/8	2.0
20	6-25/32	2.0
24	7-7/32	2.0
24*	7-7/32	2.5
30	8-3/32	2.5

* For 3" maximum stroke type 24 chambers

Figure 9.3A

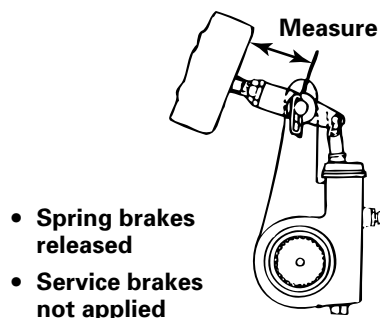


Figure 9.3B

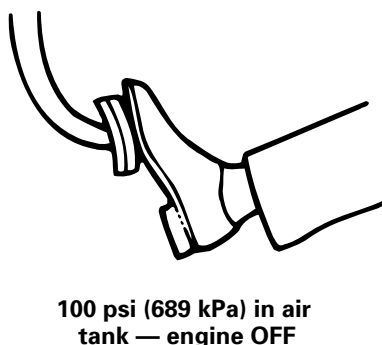
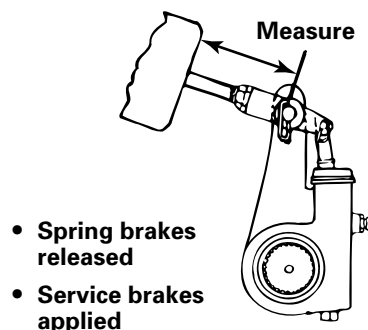




Figure 9.3C







Fastener Torque Table for Q Plus™ LX500 and MX500 Brakes

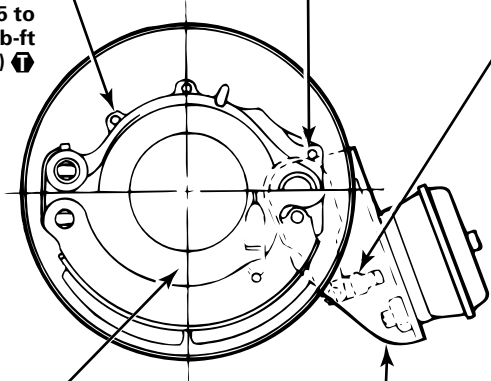
DUST SHIELD MOUNTING (4) or (6)

CAST SPIDER
Tighten dust shield mounting screws
0.375-16, Grade 5 to 25-35 lb-ft (34-48 N•m) 

STAMPED SPIDER
Tighten dust shield mounting screws
0.312-18, Grade 5 to 15-20 lb-ft (20-27 N•m) 



CAM BRACKET MOUNTING (4)
.500"-13 Thread (Cast Spider)
Grade 8 = 90-120 lb-ft (122-163 N•m) 
.562"-12 Thread (Stamped Spider)
Grade 8 = 180-190 lb-ft (243-257 N•m) 


PUSH ROD LOCK NUT (1)
.625"-18 Thread
25-50 lb-ft (34-68 N•m) 
.500"-20 Thread
20-30 lb-ft (27-41 N•m) 




BRAKE MOUNTING BOLTS
Grade 8 bolts with lock nuts and two hardened washers on each bolt.


AIR CHAMBER MOUNTING (2)

CAST SPIDER
Tighten chamber bracket mounting bolts
Grade 5: 65-85 lb-ft (88-116 N•m) 
Grade 8: 90-120 lb-ft (122-163 N•m) 

STAMPED SPIDER
Tighten chamber bracket Grade 8 mounting nuts to 180-19 lb-ft (244-257 N•m) 

Add camshaft spacing washers to provide between 0.005-0.030" (0.13-0.76 mm) maximum end play.

Bolt Size	Torque 
1/2"-20	85-115 lb-ft (115-156 N•m)
9/16"-18	130-165 lb-ft (176-223 N•m)
5/8"-18	180-230 lb-ft (243-311 N•m)

Grade 8 Nuts and Hard Flat Washers 						
Chamber Size	16	20	24	30	36	Spring Chamber
Bendix	30-45 lb-ft (41-61 N•m)			45-65 lb-ft (61-88 N•m)		65-85 lb-ft (88-115 N•m)
Midland	35-50 lb-ft (48-68 N•m)		70-100 lb-ft (95-136 N•m)			
MGM	35-40 lb-ft (48-54 N•m)		100-115 lb-ft (136-156 N•m)			
Anchorlok			110-115 lb-ft with hex nut and washer (149-203 N•m)			
			85-95 lb-ft with lock nut and washer (115-129 N•m)			

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Printed in the USA

Maintenance Manual MM-96173
Issued 06-97
16579/24240

